

**ESA-011-2 Appleton Spring Mill - Roaring Spring
PUBLIC REPORT**

Introduction:

The Appleton Spring Mill facility, located in Roaring Spring, PA, is an integrated pulp and paper mill that produces carbonless and security specialty paper products. Local hardwood products supply the Kraft mill, which includes five batch digesters that supply two blow tanks. There are three paper machines, all under a single roof. The plant has a debarking and chipping operation, a chemical recycling facility, waste treatment plant, and uses combinations of fuels, including black liquor, bark, sludge and coal in recovery and power boilers that provide all of the plants steam demands. The plant uses the steam for both mechanical drive and process heating purposes (steam is not used for electrical power generation).

Objective of ESA:

The goal of the ESA was to apply the PSAT program, associated screening, measurement and analysis methodologies to several systems in order to:

- a) train plant personnel on the use of the DOE tools and methods, and
- b) identify savings potential in the selected systems and perform a preliminary evaluation of the cost-effectiveness of implementing projects to reduce energy consumption.

Focus of Assessment:

Two groups of pumping systems were selected for assessment:

- a) Pumping systems used in the blow tank and initial brownstock washing system, and
- b) Pumping systems used in the bleaching section of the plant.

Approach for ESA:

General methodology

The plant technical lead, J.B. Williams, participated in an introductory webcast on the PSAT program and DOE-recommended prescreening methods prior to the plant assessment. Mr. Williams, plant engineering and maintenance manager, has had many years of experience in essentially all aspects of plant operation. Using pre-existing system knowledge, he selected the two groups of systems noted above to focus on during the assessment. A critical element of this prescreening was a spreadsheet that plant staff had assembled tabulating motor and pump nameplate information for a significant portion of the plant's pumping population. Energy improvements had already been made to many systems over the last few years. The underlying methods in identifying these opportunities were very similar to those endorsed by the DOE, so the plant was clearly already on an excellent track.

Specific techniques

For the blow tank and initial brownstock washing system portion, extensive reliance was given to field measurements. Flow rates in several systems handling ~200° F filtrate from the first stages of brownstock washing were measured using a clamp-on portable ultrasonic flow provided by Oak Ridge National Laboratory (ORNL). Pump suction and discharge pressures were also recorded using ORNL-supplied equipment. Motor powers were measured by plant staff using portable power analyzers provided by the plant. The field measured data were combined with process data from permanently-installed instruments to provide a basis for further analysis.

For the bleach section of the plant, opportunity assessment was done with a relatively low reliance on field measurements. General process knowledge, component design information, and indications from permanently-installed devices formed the basis for the assessment.

Both the PSAT program and the associated Valve tool were used extensively. J.B. Williams and Chris Powers (pulp mill superintendent) alternated in the use of the two tools. Messrs. Williams and Powers quickly acclimated themselves to the tools and the general methodology. (This was due, in no small part, to their excellent pre-existing knowledge and experience; this will be discussed further below.)

General Observations of Potential Opportunities:

Plant annual operating energy data (all in MMBtu)

Natural Gas	267,676
Electricity	505,592
Other Fuels	2,787,870
Total	3,561,138

Electrical cost rate used for analysis purposes: 5.45 cents/kWh

General comments and observations

The company has established guidelines that call for 20% reduction in energy consumption over the next three years. At least with respect to pumping systems at Spring Mill, it is the assessor's judgment that achieving an overall 20% reduction while constrained by a 3 year simple payback requirement at this specific facility is very unlikely. There are a couple of rationales for this observation:

- a) Over one-third of the connected pumping system power in the 100- to 250-hp range has already been modified to optimize energy use. While some opportunity remains in this range, the "low hanging fruit" have already been picked.
- b) Systems that are 60 hp or less represent about 90% of the pumping population and about 47% of the connected motor power for pumps. While the population distribution is fairly typical, the fact that almost half of the connected power is in this range is not. Using the DOE's prescreening guidelines, this portion of the plant systems would generally not be prime candidates for system-level review – and this has clearly been the practice at Spring Mill.

While there are some opportunities for further reduction (as discussed below), the plant is already well along the path toward making changes that are practical to make in a preemptive manner.

The plant is also clearly attuned to making energy-improving changes when circumstances are most favorable. For example, when faced with control valve repair or replacement, it is a standard practice to evaluate the potential for switching to adjustable speed control. Thus, even systems for which design changes are not practical to make preemptively, plant engineering is already looking for opportunities to make changes when economic justification becomes more feasible. This, too, is exactly in concert with practices recommended in the PSAT training.

The Spring Mill plant is thus already following several recommended best practices (as covered in the PSAT software and training curricula), and should be congratulated on its progressive energy policies.

A final note: the pumping system understanding and engineering practices of the primary plant contact, J.B. Williams, is outstanding – it is the highest level that the assessor has found at any plant where he has worked previously (roughly 100 large industrial facilities). This applied knowledge is very likely the reason that the plant has already made significant strides in optimizing pumping systems.

Specific opportunities observed

In both the brownstock and bleach plant areas that were considered, potential savings associated with the reduction or elimination of valve throttling-related losses were identified. Some of the identified opportunities are not likely to be practical to implement as standalone changes (insufficient payback on investment). However, even these applications may become more feasible as either related equipment repairs or system modifications (made for non-energy reasons) are pursued.

Detailed calculations and assumptions for the individual systems are provided in accompanying presentations and spreadsheets.

Management Support and Comments:

The plant support and coordination for this assessment was outstanding. An extensive list of measurements (power, pressure, flow) were required at multiple points, so demands on plant support staff were relatively high. The knowledge available through the primary plant contact, J.B. Williams, plant Engineering and Maintenance Manager, was extraordinary. Chris Powers, pulp mill superintendent also provided extremely helpful insights into current operating methods.

DOE Contact at Plant/Company:

J.B. Williams, Manager of Engineering and Maintenance